2008

# AGAS: Development of Affordable Guided Airdrop System (overview)

Aerodynamic Decelerator Systems Center

Monterey, California: Naval Postgraduate School

http://hdl.handle.net/10945/35724

AERODYNAMIC DECELERATOR SYSTEMS CENTER

# Aerodynamic Decelerator Systems Center



## AGAS: Development of Affordable Guided Airdrop System

[Overview] [Video_Clips] [Other_Downloads] [Publications]

**Overview**

This research addressed the development of an autonomous guidance, navigation and control (GN&C) system for a flat solid circular parachute. This effort was a part of the Affordable Guided Airdrop System (AGAS) that integrated a low-cost guidance and control system into fielded cargo air delivery systems. The AGAS concept, its architecture and components had been developed by Vertigo, Inc. Simplified model of a parachute was used at the first stage to develop and evaluate the performance of a modified bang-bang control system to steer the AGAS along a pre-specified trajectory toward a desired landing point (Fig.A). The synthesis of the optimal control strategy was based on Pontryagin's principle of optimality.
The second stage of this research aimed primarily at flight-testing of designed algorithms included the development of a complete 6-DoF model of controllable circular parachute. This stage also included extensive hardware-in-the loop simulation set up at the basement of Halligan Hall (Fig.B).

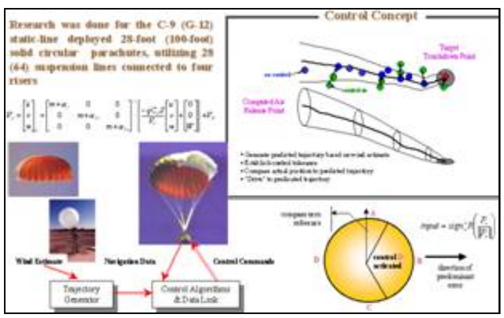


Figure A. The AGAS control concept.

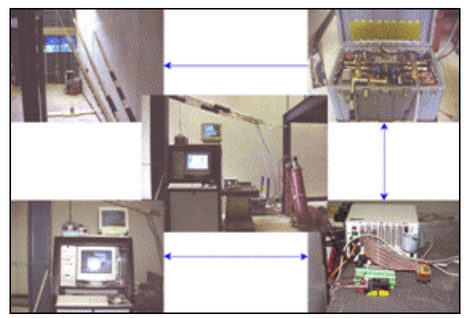

Figure B. Hardware setup for hardware-in-the-loop simulation.

Finally, the complete system was field tested at the U.S. Army Yuma Proving Ground, Yuma AZ. It took only 15 drops to tune the developed GN&C algorithms to match the full-scale 500-lb system. The AGAS was first demonstrated to public during Precision Airdrop Technology Conference and Demonstration (PATCAD) in the fall of 2001 (Fig.C). During this demonstration the developed AGAS managed to overperform other same-weight systems including both circular parachutes and parafoils. Being released from about 2km altitude four AGAS systems landed with the miss distances of less than 78m with 100m being the requirement. To better appreciate this result it should be noted that the four uncontrolled G-12 parachutes realized at the same time were spread out within 1.4km from the target. Ever since, the AGAS was demonstrated at each PATCAD (2003, 2005, and 2007).
Nowadays, Capewell Components Company, South Windsor, CT sells this system in four different weight configurations: AGAS-500, AGAS-2000 and AGAS-5000 (Fig.D).

Figure C. Two AGAS in action.

Figure D. The AGAS control unit.

[Overview] [Video_Clips] [Other_Downloads] [Publications]

NPS Home / Contacts / Accessibility / Privacy Policy / FOIA